OUTCOME OF NECK OF FEMUR FRACTURE IN ELDERLY TREATED NON OPERATIVELY IN HOSPITAL SELAYANG

By

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Dissertation Submitted In Partial Fulfillment of The Requirements For The Degree Of Master of Medicine (Orthopaedics)

SCHOOL OF MEDICAL SCIENCES

UNIVERSITI SAINS MALAYSIA

2016

ACKNOWLEDGEMENT

I would like to take this opportunity to express my gratitude to the people who has contributed in helping me successfully completing my dissertation research, either directly or indirectly.

First and foremost, I would like to express my sincere thank you to my supervisor, Dr. Mohammad Paiman, Hand Surgeon, who has guided me as well as supported me in successfully completing this dissertation in every step of the way.

Apart from that, I would also like to take this opportunity to express my thanks to the Head of Orthopaedic Department, Hospital Selayang, Dato Dr. Ramli Baba, for allowing me to conduct my dissertation research on his patients in Hospital Selayang. His guidance and teaching has allowed me to assess his patients and to collect data for my research effectively.

Prof. Dr Mohd Imran Yusof, the Head of Orthopedics Department, Universiti Sains Malaysia for his encouragement and support for the conduction of the study.

Also my heart felt gratitude towards Puan Wani, statistician, for helping me understand and solving the statistical analysis problem encountered by me throughout this study period.

Last but not least, the endless support given by my family has encouraged me to successfully complete this dissertation research.

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List of abbreviation

NOF	Neck of Femur
SF- 36v2	Short Form – 36 (version 2)
PCS	Physical Component Summary
MCS	Mental Component Summary
ADL	Activities of Daily Living
%	Percentage
°	Degree
US $	United States Dollars
USM	University Sains Malaysia
HRQOL	Health Related Quality Of Life
QM	Quality Metric
ACS	Acute Coronary Syndrome
Hepatocellular ca	hepatocellular carcinoma
SD	Standard Deviation

ABSTRAK

PENGENALAN: Patah tulang pinggul kerap berlaku dalam kalangan golongan berusia. Ia mempunyai kadar mortaliti dan morbiditi yang tinggi. Pembedahan merupakan pilihan rawatan yang utama untuk mengelakkan komplikasi. Walau bagaimanapun ianya boleh di rawat tanpa memerlukan pembedahan. Di dalam kajian ini, fungsi pesakit selepas rawatan tanpa pembedahan di nilai

KAEDAH: Seramai 55 orang pesakit digunakan untuk kajian ini bermula dari Januari 2010 sehingga Januari 2014. Daripada jumlah 55 orang, pesakit yang masih hidup di panggil dan ditemu ramah di klinik. Fungsi pesakit selepas rawatan tanpa pembedahan dinilai menggunakan SF-36 soalan penilaian kesihatan. Sebab sebab utama pesakit memilih untuk menjalani rawatan tanpa pembedahan juga dikaji dan penyebab utama yang menyumbang kepada mortaliti dikenal pasti.

KEPUTUSAN: Berdasarkan kajian yang dijalankan, kadar hidup untuk pesakit warga tua yang mengalami patah pada leher tulang pinggul dan dirawat tanpa pembedahan adalah sebanyak 58.2%. Kadar mortaliti untuk pesakit yang menjalani rawatan tanpa pembedahan untuk patah tulang pinggul adalah 41.8 % setahun. Berdasarkan Mental Component Summary (MCS) skor, fungsi pesakit selepas menjalani rawatan tanpa pembedahan adalah sederhana manakala penilaian berdasarkan Physical Component Summary (PCS) skor menunjukkan keputusan dibawah tahap sederhana. Terdapat dua sebab dikenal pasti megapa pesakit memilih rawatan tanpa pembedahan. . Skor purata untuk MCS adalah sebanyak 57.5 manakala purata PCS adalah 46.3.Terdapat dua faktor yang dikenalpasti sebagai faktor utama penyebab pesakit warga tua yang mengalami kepatahan ini menjalani rawatan konservatif tanpa pembedahan. Dua faktor tersebut adalah; pesakit mempunyai masalah kesihatan yang menyebabkannya tidak sesuai untuk menjalani

pembedahan major, manakala faktor kedua adalah pesakit dan ahli keluarga tidak bersetuju untuk mendapat rawatan secara pembedahan. Faktor pertama

menyumbang sebanyak 54.5% daripada 55 orang pesakit dalam kajian kami, manakala selebihnya 45.5% adalah peratusan daripada faktor kedua tersebut. Sebanyak 23 orang daripada pesakit kami telah meninggal dunia dan punca utama kematian yang dikenalpasti adalah jangkitan kuman pada paru-paru dan ia mempunyai satu hubung kait yang signifikan dengan status kematian tersebut dalam kajian kami

KESIMPULAN: Walaupun pembedahan merupakan cara utama untuk merawat masalah patah tulang pinggul tetapi ianya juga boleh dirawat tanpa pembedahan. Dengan penjagaan yang baik dan juga rehabilitasi, tahap kesihatan pesakit boleh dipertingkatkan.

ABSTRACT

INTRODUCTION: Femoral neck fracture is a common occurrence among the elderly age group especially when the aging population around the world is on the rise. This type of fracture poses a high mortality and morbidity, hence, they are commonly treated operatively to prevent complications. However, this fractures has been treated non-operatively in certain circumstances. In this study, we assess the functional outcome of elderly patients with femoral neck fracture that was treated non-operatively.

METHODS: We recruited 55 patients in this study from January 2010 to January 2014. Out of the total 55 patients, the patients who are still alive are called and interviewed in the clinic. The functional outcome after neck of femur fracture being treated non-operatively were assessed using the SF-36 health survey questionnaire. The reason for opting non-operative treatment were explored and also the major cause of mortality among these patient was also identified.

RESULTS: From our small series conducted, the survival rate for elderly patients with neck of femur fracture treated non-operatively was 58.2%. The mortality rate for elderly patients with neck of femur fractures treated non-operatively was around 41.8% per year. With regards to the quality of life, the functional assessment for our patients revealed that they fare fairly when the mental component is taken into account. With the mean Mental Component Summary (MCS) of 57.5 and mean Physical Component Summary (PCS) of 46.3.This means the functional outcome for elderly patients with neck of femur fracture treated non-operatively was average based on the Mental Component Summary (MCS) score and was below average for the Physical Component Summary (PCS) score. There were 2 reason identified for these patients opting for non-operative

intervention; that is patients are medically unfit accounting for 54.5% of the total 55 patients and another reason is patient and family refusal which leaves

us with 45.5%. The major cause of mortality from the 23 patients who passed away was identified as pneumonia which showed significant association with the mortality status.

CONCLUSION: Although the standard treatment for neck of femur fractures are operative intervention, under certain circumstances, it can be treated non-operatively. With proper nursing care and rehabilitation, the general health among these patients can be improved.

1.0 INTRODUCTION

1.1 BACKGROUND OF STUDY

Neck of femur fracture is very common among the elderly age group. Incidence of fracture around the hip joint amongst the elderly population is increasing in trend. The world population shift towards the older generation furthermore increases the incidence of this pathology.

Due to osteoporosis process, the hip bone becomes very fragile and easily fractured. Due to the unique blood supply to the head of femur, almost all neck of femur fracture either needs fixation or replacement.

These type of fractures has high incidence of morbidity and mortality especially among the elderly age group. These is mostly due to their mental status and post trauma complications such as prolonged remobilization and extended hospital stay.

Patients are treated non-operatively when the risks of operation outweighs the outcome of operative intervention or if the patient refuse for it.

Due to the high mortality and morbidity rates, fractures around the hip, especially neck of femur fractures are treated with operative interventions. However, there are incidence that fracture neck of femur being treated non-operatively. There are mostly due to patient factors such as refusal for surgical intervention or medically unfit patients. Although such

incidence are reducing in trend in there medically advance era, but neck of femur fractures are being treated non-operatively in some instances.

Undisplaced femoral neck fracture can be treated non-operatively (Raaymakers EL *et al*, 1991). Unfit patients are treated non-operatively in which surgical and anesthetic

intervention are deemed risky and probably have worse outcome (Kyo T *et al*, 1993). The concern is however is the mortality and morbidity that is associated with this non operated group (Faraj *et al*, 2008).

Multiple co-morbidity are associated with the elderly age group which makes the surgical intervention in neck of femur fracture are trickier. Careful evaluation of the medical illness, physical disability and cognitive function should be taken into account in determining a good outcome.

The most important factor affecting life expectancy were pre-existing poor medical, functional and cognitive scores. Pre-operative medical condition are useful indicator for determining the functional prognosis and survival (Kyo T *et al*, 1993).

Majority of the literature that has been reviewed focuses on the epidemiology of fracture around the hip and neck of femur fractures, the mortality in hip fractures and the functional outcome post fracture fixation. No papers that have been reviewed showed a functional outcome score of fracture around the hip that are treated non-operatively especially in neck of femur fracture.

This study is aimed to assess the functional outcome and the general wellbeing of the elderly patients who had sustained neck of femur fracture that did not undergo any surgical intervention for the fracture. This study was conducted in a single center which is Hospital Selayang. The assessment was done based on the General Health Short Form-36 (SF-36) as a holistic approach to a patient's general health status.

2.0 LITERATURE REVIEW

2.1 Epidemiology

The UN Human Rights Commission in 1999, has proposed to use the term “older people” instead of the word “elderly” (P. Kannus *et al,* 1996). These people are the fastest growing age group in the world and the number of hip fractures annually will grow with the continued ageing population. Even if this age-related incidence of fractures around the hip continues to grow with unchanged rates, the number of fractures around the hip worldwide is expected to increase from 1.7 million in 1990 to 6.3 million in 2050 (L. K. H. Koh *et al*, 2001). Assuming that the age-related incidence will increase by only 1% per year, the number of hip fractures in the world will reach the figure of 8.2 million in 2050 (Jennifer M.T.A *et al* 2014).

Femoral neck fractures and per-trochanteric fractures are of approximately equal incidence (Marottoli RA *et al* 1994) and together make up over 90% of the proximal femur fractures and the remaining 5-10% are sub-trochanteric. According to more recent research, half of the proximal femur fractures are intraarticular fractures of the femoral neck (Gonzαlez-Rozas M *et al*, 2012).

Most of the hip fractures occur after a fall. It is estimated that the lifetime risk of hip fracture was 23.3% for men and 11.2% for women (Wolinsky FD *et al*, 1994).

As the world population ages, the incidence of neck of femur fracture based on sex are different. At a younger age group, the incidence of fracture around the hip is more towards men

as they are more involved in motor vehicle accidents and work related injuries both of which are high energy injuries. As the population ages, this incidence involves more towards the

female as they are more prone to have an osteoporotic bone. These is due to hormonal changes after menopause.

The incidence of hip fracture among multiracial Singaporean residents aged 50 years old and above from 1991 to 1998 were 152 men and 402 in women (L. K. H. Koh *et al*, 2001). Among the three major racial groups, in men, the Chinese had significantly higher age-adjusted hip fracture rates (per 100,000): 168 (95% confidence interval (CI) 158-178) compared with 128 (95% CI 105-152) for Indians and 71 (95% CI 54-88) for Malays. A similar pattern occurred in women: 410 (95% CI 395-425), for Chinese compared with 361 (95% CI 290-432) for Indians and 264 (95% CI 225-303) for Malays (L. K. H. Koh *et al*, 2001. The incidence of fracture around the hip was more than double for women compared with men (Jennifer M.T.A. *et al*, 2014).

Where else the incidence of hip fracture in Malaysian individual above 50 years of age is 90 per 100,000 people in 1996 and 1997(Joon-Kiong LEE and Amir S. M. KHIR, 2007). In a 1988 study, based on hospital admission, on 118 patients at Hospital KL, we found a high Chinese incidence (53%), as well as a disproportionately high incidence in Indians (40%) but a very low incidence in ethnic Malays (Abdul-Halim AK et al, 1990). Incidentally, our study on age distribution of patients with proximal femoral fractures revealed 70% (86 out of 124) were in the 61-80 years group, with nearly 50% (55 out of 124) in the 71-80 age group. Females predominated in both the femoral neck and trochanteric fractures (Joon-Kiong LEE and Amir S. M. KHIR, 2007).

1 year mortality rates after experiencing a hip fracture are 12% to 36%, with the highest rate of mortality reported within the 1st month after fracture (Kannus P *et al*, 1999). In the UK, the mortality following a fracture neck of femur is between 20% and 35% within 1 year in patients aged 82 ± 7 years, of which 80% were women (Raaymakers EL *et al*, 1991).

Zuckerman et al mentioned that delayed in fixation of more than 3 days will double the incidence of mortality within the 1st year after surgery (Zuckerman JD *et al*, 2000).

The femoral neck fractures are rare among young people – they are only 2% in patients under 50 years of age (Kyo T *et al*, 1993). The incidence increases with age, and after 50 years is doubled for each subsequent decade, and is 2-3 times higher in women than in men (Marottoli RA *et al* 1994) .80% of hip fractures occur in women and 90% in people older than 50 years (L. K. H. Koh *et al*, 2001).

The increase of hip fracture incidence rate is likely to become a substantial burden for the public health systems (Kannus P *et al*, 1996). The proximal femur fractures are the most devastating result of osteoporosis. They require surgical treatment, often lead to disability and are associated with high mortality rate (Kannus P *et al*, 1996).

Currently, the hip fractures represent a major economic burden on the health care systems in the world. In the United States, adjusted first-year costs associated with hip fracture for patients aged 65 years or older were US $15,196, compared with the costs of US $ 6701 for vertebral fracture (Shi N *et at*, 2009). In 1997, an assessment of direct and indirect annual costs for hip fracture treatment in the world were$131.5 billion (Johnell O *et al*, 1997). In 2005 in the United States are registered 2 million fractures with patients over 50 years old, costing a total of $17 billion for medical care. From all registered fractures, 14% were fractures of the proximal femur, but they take up a huge share of the 72% of the total value for the treatment of fractures. The total allocation of costs according to the type of treatment was 57% for hospitalized patients; 13% for outpatient treatment and 30% for long-term inpatient and institutional treatment. From the total cost of fracture treatment, 89% account for patients over age of 65 (Burge R *et al*, 2007). Hip fractures in Singapore are also costly. The mean cost of acute hospital care stands at $10,995.27

(at a standardised rate of 164 per 100,000 per year). Although our cost is lower than that of the US (US$33,000), France (€8048 to €8727), the UK

(£12,163), Belgium (Belgian francs 9534) and Finland (€14,410),and increasingly higher each year. Cost data closely correlated with the length of hospital stay. The longer the stay, the higher the cost. Hospitalisation costs increased by S$516 per day. This relationship is also influenced by the presence of comorbid illnesses, which significantly increases cost of care (Li-Tat CHEN et al, 2007). However, there is no studies done in Malaysia to evaluate the economic burden of hip fractures.

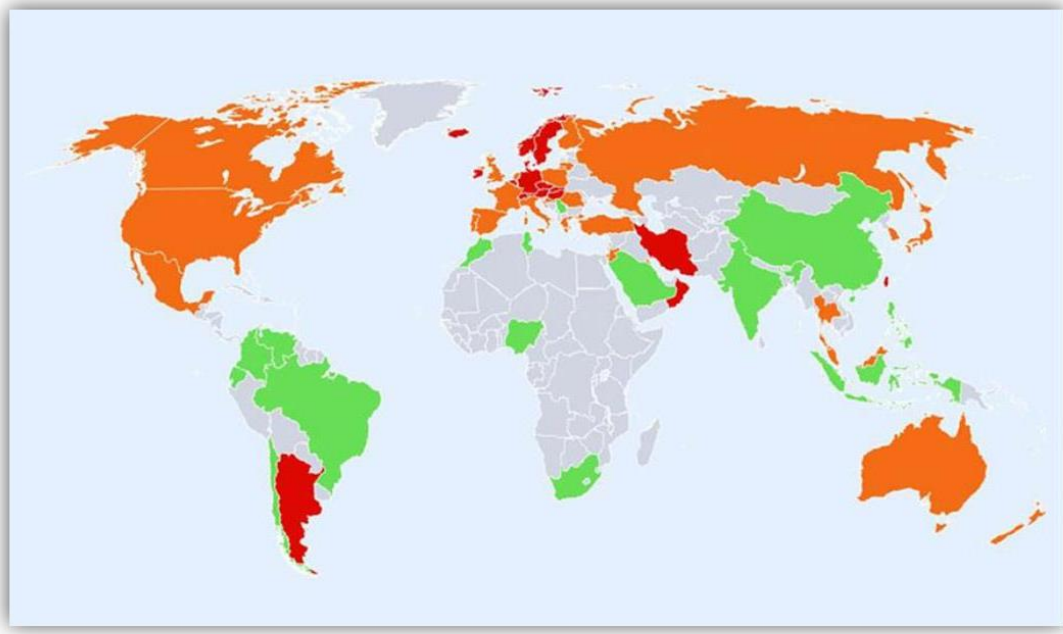


Figure 1: Hip fracture rates for men and women combined in different countries of the world categorised by risk. Where estimates are available, countries are colour coded red (annual incidence >250/100,000), orange (150–250/100,000) or green (<150/100,000)

A systematic review of hip fracture incidence and probability of fracture worldwide

J. A. Kanis & A. Odın

IOF Working Group on Epidemiology and Quality of Life

2.2 Anatomy

Osseous anatomy

The **femur**, the longest and strongest bone in the skeleton, is cylindrical shaped. In erect posture, it is not vertical, but inclining gradually downward and medially to bring the knee-joint near the line of gravity of the body. The degree of this inclination varies in different persons, and is more in the female than in the male, due to the greater breadth of the pelvis in females.

The Head (*caput femoris*) — The head is globular and forms rather more than a hemisphere. It is directed upward, medially, and a little forward. Its surface is smooth and coated with cartilage except the **fovea capitis femoris.** It is situated a little below and behind the center of the head and gives attachment to the ligamentum teres.

The Neck (*collum femoris*) — The neck is a flattened pyramidal process connecting the head with the shaft of femur. It forms a wide angle opening medially with the shaft of femur. This angle is widest in infancy, and becomes less during growth. In adult, the neck forms an angle with the shaft of about 125°. In female, in view of the increased width of the pelvis, the neck of the femur forms more nearly an acute angle with the body than it does in the male. The angle decreases during the growth period, but after full growth has been attained, it does not undergo any change. It varies considerably in different persons of the same age. The angle is smaller in short femur bone than in long bones.

In addition to projecting upward and medially from the shaft of the femur, the neck also angulates forward on an average from 12° to 14°.

The Inner Architecture of the Upper Femur —"The spongy bone of the upper femur (to the lower limit of the lesser trochanter) is composed of two distinct trabeculae systems arranged in curves:

1st which origins in the medial (inner) side of the shaft and curving upward like a fan to the opposite side of the bone;

The other, originates on the lateral (outer) portion of the shaft and arching upward and medially and ends in the upper surface of the greater trochanter, neck and head.

A. Medial (Compressive) System of Trabeculae - The compact bone over the medial part of the shaft arches near the head of the femur and gradually becomes thinner when it reaches the articular surface of the head. From a point at about the lower level of the lesser trochanter, 2 1/2 to 3 inches from the lower limit of the articular surface of the head, the trabeculae branch off from the shaft in smooth curves, spreading radially to cross to the opposite side in two well-defined groups: a lower, or secondary group, and an upper, or principal group

a. The Secondary Compressive Group

b. The Principal Compressive Group

B. Lateral (Tensile) System of Trabeculae - The compact bone of the outer portion of the shaft approaches the greater trochanter where it gradually decreases in thickness. Beginning at a point about 1 inch below the level of the lower border of the greater trochanter, thin trabeculae are given off from the outer portion of the shaft. These trabeculae lie in three distinct groups:

c. The Greater Trochanter Group

d. The Principal Tensile Group

e. The Secondary Tensile Group

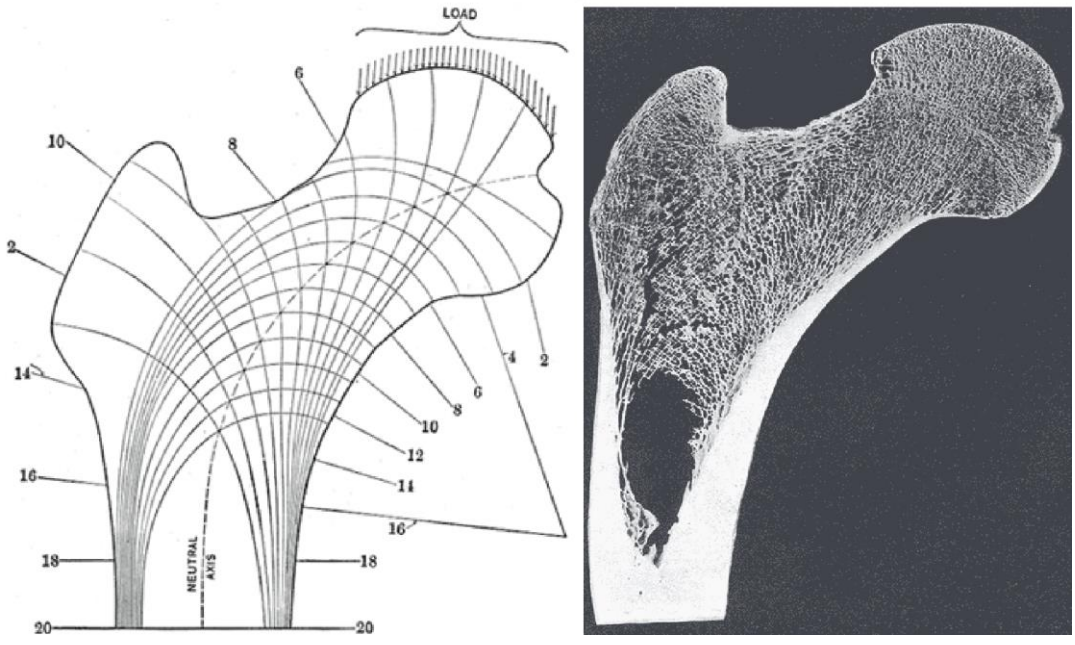


Figure 2: Diagram of the lines of stress in the upper femur. These result from the combination of the different kinds of stresses at each point in the femur. (After Koch.) courtesy of Gray's anatomy

Blood supply

The blood supply to the proximal part of the femur is divided into 3 major groups. The first is the extracapsular arterial ring which are located at the base of the femoral neck. The second is the ascending cervical branches of the arterial ring on the surface of the femoral neck. The third is the arteries of the ligamentum teres.

The large branch of the medial femoral circumflex artery forms the extracapsular ring posteriorly. And anteriorly it is formed by a branch from the lateral femoral circumflex artery. The ascending cervical branch ascends on the surface on the femoral neck anteriorly along the intertrochanteric line.

Posteriorly, the cervical branch will run under the synovial reflection toward the rim of the articular cartilage. The lateral vessels are the most vulnerable to injury in femoral neck fractures.

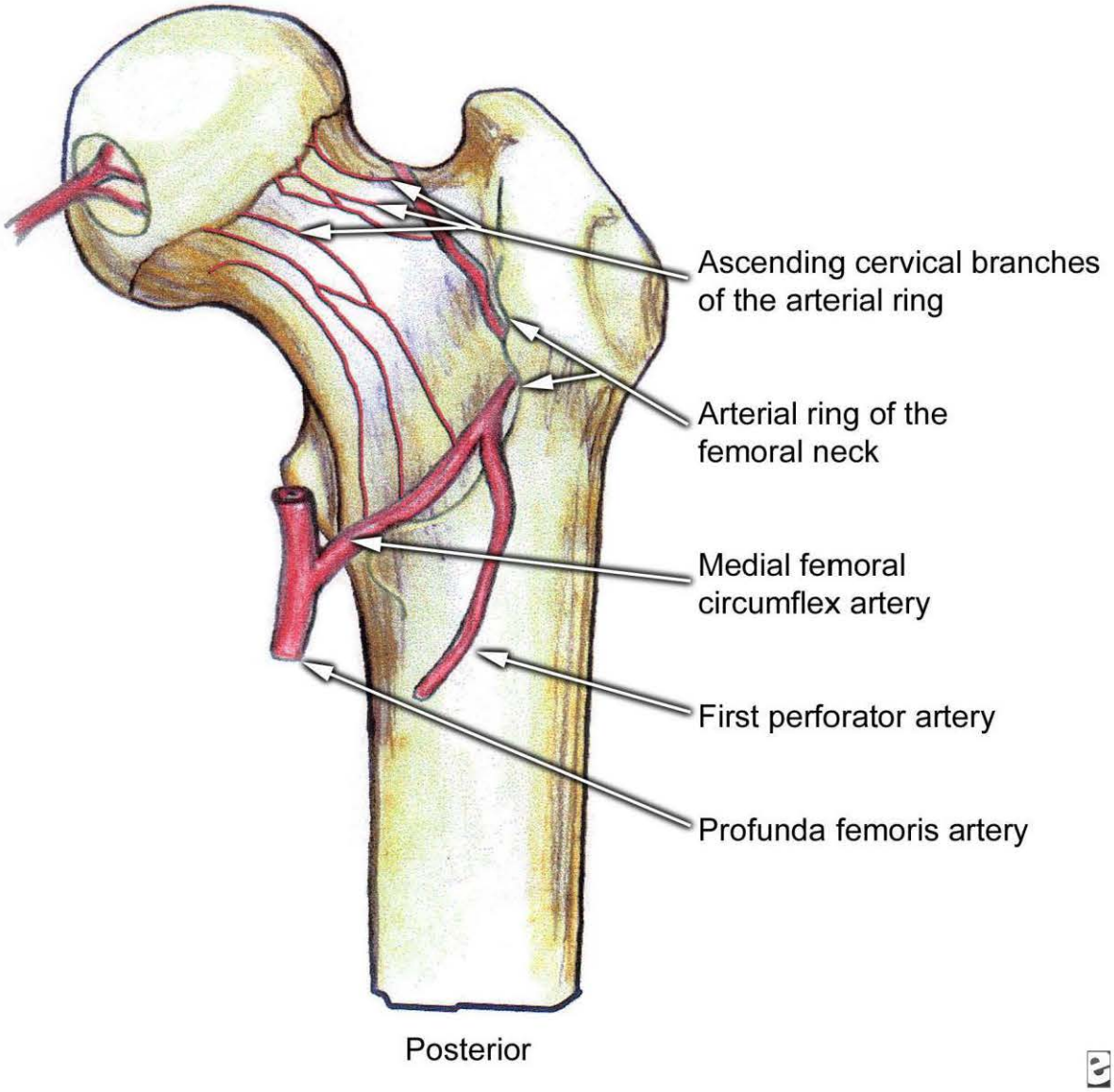
Then a second ring of vessels is formed as the ascending cervical vessels approach the articular margin of the femoral head. From this, the epiphyseal arteries are formed.

The lateral epiphyseal arterial group supplies the lateral weight-bearing portion of the femoral head. The epiphyseal vessels are joined by the inferior metaphyseal vessels and vessels from the ligamentum teres.

Femoral neck fractures frequently disrupt the blood supply to the femoral. The superior retinacular and lateral epiphyseal vessels are the most important sources of this blood supply. Displaced intracapsular hip fractures tear the synovium and the surrounding

vessels. The progressive disruption of the blood supply can lead to serious clinical conditions and complications, including osteonecrosis and nonunion.

Figure 3: Posterior view of the extraosseous blood supply to the femoral head.



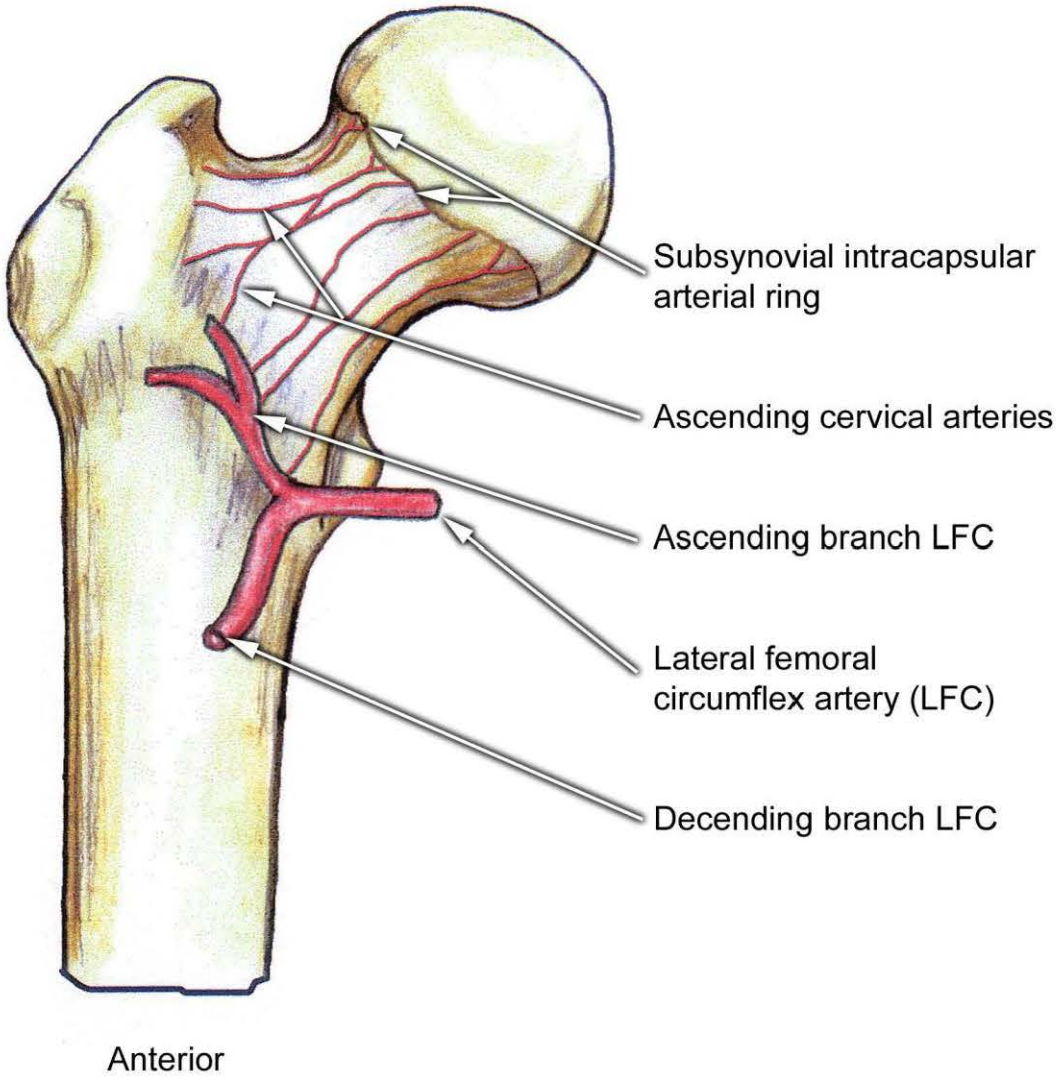

Subsynovial intracapsular arterial ring
Ascending cervical arteries
Ascending branch LFC
Lateral femoral circumflex artery (LFC)
Decending branch LFC
Anterior

Figure 4: Anterior view of the extraosseous blood supply to the femoral head

2.3 Treatment of neck of femur fractures

The main goals of treatment in elderly patients with femoral neck fractures are to promote healing at the fracture site, to prevent long term immobilization complications, and to have them return to their near normal function. The primary goal of fracture management is to return the patient to his or her premorbid level of function (Koval KJ, 1994). This is accomplished with either surgical or nonsurgical management. Several factors must be considered before any treatment plan is recommended to these patients.

Most hip fractures are treated with operative intervention. Undergoing the surgery is a major stress, especially in the elderly patients. Pain is significantly worse in these type of patients, resulting in prolonged immobilization. Since prolonged immobilization can be more of a health risk than the surgery itself, post-op people are encouraged to become mobile as soon as possible, often with the assistance of physical therapy (Arnold WD *et al*, 1984). Patients will be put on limb traction while awaiting surgeries. Regional nerve blocks are useful for pain management in hip fracture (Barnes R *et al*, 1976).

If operative treatment is refused or the risks of surgery are considered to be too high the main emphasis of treatment is on pain relief (Bennell KL *et al*, 1996). Skeletal traction can be considered for long term traction. Aggressive chest physiotherapy is needed to reduce the risk of pneumonia and skilled rehabilitation and nursing to avoid pressure sores and DVT/pulmonary embolism Most people will be bedbound for several months (Barnes R *et al*,

1976). Non-operative treatment is no longer an alternative in developed countries with modern health care (Blomfeldt R *et al*, 2005).

What is the best method of treatment for a patient with a displaced subcapital fracture of the neck of the femur? There are several possibilities:

(a) nonoperative treatment, (b) reduction of the fracture with internal fixation, or (c) replacement of the femoral head or the entire hip joint with a prosthesis.

2.3.1 Non operative

Occasionally, we encounter unfit patients where surgical intervention and anaesthetics complications are deemed too risky. Thus forcing the surgeons to pursue a non-operative treatment in such patients. This can be justified by knowing that the outcome of surgery probably may be worse than not undergoing surgery at all. The indications for non-operative treatment are limited primarily to the compression type fracture (Garden type 1).

The non-operative treatment may be indicated for debilitated, usually demented, bedridden patients who are non-ambulators and possibly including those who may be able to transfer to a chair with significant assistance.

Although it is relatively easy to forgo surgery for such patients if they have severe cardiopulmonary illness and a very limited life span, some do not appear to be on the verge of death. For these individuals, it is hard to justify surgical treatment in view of the limited benefit it offers and its high risks (Blickenstaff LD *et* al, 1966). A good test for the adequacy of non-

operative treatment in such patients is the achievement of comfort sufficient to tolerate routine nursing care (Bennell KL *et al*, 1996). A proper administration of analgesia to alleviate the pain

and careful logrolling will often suffice and this may permit the patient to remain in a chronic care setting.

In a series of 247 undisplaced femoral neck fractures in Hungary, of which 122 were primarily treated non-operatively, and 125 with primary operative stabilization,they found that two-thirds of the operatively treated were able to walk alone when they left hospital but only one-quarter of the non-operatively treated patients were able to achieve that feat. General complications were also recorded more in the non-operatively group (P.Cserhati et a, 1996).

Mortality with nonoperative treatment was higher with bed rest (73%) compared to

early mobilization (odds ratio 3.8, 95% CI 1.1–14.0). There was no significant difference in mortality between operatively treated patients (29%) and patients treated nonoperatively with

immediate mobilization (19%). The overall mortality in the operatively treated group was not significantly different as compared to those patients mobilized early in the nonoperative treatment group. This information may be useful for families of medically unwell patients as they evaluate the risks of proposed surgical treatment of hip fractures (Rina Jain et al, 2002).

In a patient who is medically unfit for surgery but is able to be mobilized, nonoperative treatment with early mobilization represents an alternative that is not necessarily associated with immediate or definite mortality (Helen HG Handoll et al, 2008).

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2.3.2 Operative treatment

Undisplaced Femoral Neck Fractures

As defined previously, undisplaced femoral neck fractures include both valgus impacted (Garden grade I) and complete (Garden grade II) femoral neck fractures because of the similar prognosis of both fracture types (Barnes R *et al*, 1976). Operative intervention with internal fixation is indicated for most of the undisplaced femoral neck fractures. It has been shown that early mobilization of the patient will result in a lower mortality rate (Swiontkowski MF *et al*, 1986). By operative intervention using internal fixation will allow early mobilization of the patient without displacement of fracture reduction in most cases. With conservative treatment (recumbent position for 7 weeks), the displacement rate or disimpaction rate has been shown to be 10%to 27% by Bentley (1968), Hilleboe and colleagues (1970), and Jensen and Hogh (1982). Bentley reported that rates of avascular necrosis after a non-displaced femoral neck fracture were 14% for conservative treatment and 18% for internal fixation. If displacement occurs, the rates more than double, and prosthetic replacement may become the treatment of choice for an older patient. No difference in clinical results is apparent with cannulated screws or Knowles pins (Trueta J *et al*, 1953). One retrospective review suggests that the reoperation rate for non-displaced or impacted femoral neck fractures in patients older than 80 years who are treated by internal fixation may warrant consideration of hemiarthroplasty (Versluysen M *et al*, 1985).

Displaced Femoral Neck Fracture

The treatment for displaced femoral neck fractures is aimed at restoring the hip joint function. Early and rapid mobilization of these elderly patient is thought to reduce the risk of medical complications of prolonged bed-bound and improve the ultimate functional outcome.

In addition, it also decreases the cost of lengthy stay in an acute hospital care. Nonunion, avascular necrosis with late segmental collapse of the femoral head causing symptoms and failure of fracture fixation have long been recognized as serious complications that compromise the results of treatment of femoral neck fractures. In striving to provide mobilization while avoiding these and other complications, the treatment scheme has evolved from closed reduction and casting, to internal fixation, to prosthetic replacement, and presently to selective use of prosthetic replacement or internal fixation (Bray TJ *et al*, 1988). The currently offered algorithm for displaced femoral neck fractures recommends internal fixation, after closed or open reduction, for most patients with adequate bone density (Delamarter R *et al*, 1976).

Prosthetic replacement is reserved for physiologically older patients in whom internal fixation is unlikely to succeed—those with marked osteopenia, fracture comminution, or both (Swiontkiwski MF *et* al, 1986). These patients are physiologically elderly, with low functional demands. Their ambulation are restricted to their homes and they may be unable to assist their own care, with their life expectancy often limited. They are thus less at risk of having late complications that might require revision of an arthroplasty (Van Dortmont LM *et al*, 1994).